

CLASSIFICATION OF FOODBORNE PATHOGENS SOURCES OF CONTAMINATION

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Taxonomic classification

- Prions
- Viruses
- Bacteria
(Algae, cyanobacteria)
- Fungi
- Protozoa
- Metazoan parasites
- Toxic plants and animals

Classification by mode of pathogenesis

Infectious agents (viable [infectious] agent present in food when ingested; must multiply in host's body to cause disease [incubation period])

Prions — new variant Creutzfeldt-Jakob disease (vCJD)

Viruses — hepatitis A, noroviruses, etc.

Bacteria — *Campylobacter*, *Clostridium perfringens*, *Escherichia coli*, *Listeria*, *Salmonella*, *Shigella*, *Vibrio*, etc.

Protozoa — *Cryptosporidium parvum*, *Entamoeba histolytica*, *Giardia lamblia*, *Toxoplasma gondii*, etc.

Metazoan parasites (helminths) — roundworms, tapeworms, flukes

Intoxicating agents (toxic substance present in food when ingested; onset of illness may be rapid)

Bacteria — *Bacillus cereus*, *Clostridium botulinum*, *Staphylococcus aureus*
(Algae, cyanobacteria)

Fungi— *Aspergillus*, *Fusarium*, *Penicillium*, etc.

Toxic plants and animals — mushrooms, cassava, fugu, etc.

“Exceptional” foodborne diseases

Allergy — serologic reaction

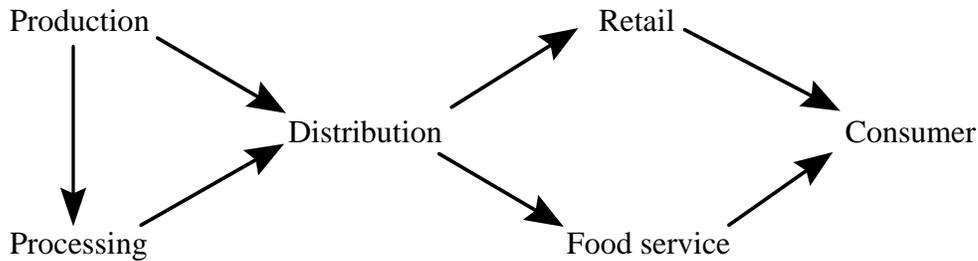
Intolerance — enzyme deficiency (abnormal people?)

Idiopathic illnesses

Acute — “Chinese restaurant syndrome”

Chronic — cancer, heart disease

Sources of foodborne pathogens



Preharvest

Inherent toxicants — acorns, cassava, olives, etc.

Zoonoses — enterohemorrhagic *E. coli*, *Trichinella* sp., (*Brucella* sp., *Coxiella burnetii*, *Mycobacterium bovis*, prions of bovine spongiform encephalopathy [BSE]), etc.

Field contaminants — *Cryptosporidium parvum*, enterohemorrhagic *E. coli*, *Vibrio parahaemolyticus*, etc.

Harvest or slaughter

Cross-contamination — *Listeria*, *Salmonella*

Water — enterohemorrhagic *E. coli*, hepatitis A virus, etc.

Humans — hepatitis A virus, *Salmonella*, etc.?

Processing

Problems rare in U.S. at present

Colonization of facilities by *Listeria*, *Salmonella*

If bakeries are included, viruses

Storage and distribution — most problems with temperature control, rather than contamination

Retailing and food service — opportunities for human-source contamination: hepatitis A virus, noroviruses, *Shigella*, pathogenic *E. coli* (other than EHEC); cross-contamination with EHEC, *Listeria*, *Salmonella*, etc.

Final preparation and serving — opportunities for human-source contamination: bacteria & viruses, *Giardia lamblia*, *Taenia solium*, etc.

Summary

- Foodborne pathogens can be classified by conventional taxonomic systems, but also on the basis of the ways they cause foodborne disease
- Every stage of progress of food from production to the final consumer has some potential for the introduction of pathogens; some of these risks are more easily remedied than others.

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